Appendix E:
PrintSTEP Air Levels: Emissions Calculations

Overview
The Emissions Calculations method allows you to account for efforts you have taken to reduce the amount of air emissions from your facility in determining your PrintSTEP Air Level. This may include use of low-VOC and non-HAP products, retention factors for lithography, capture efficiency and destruction removal efficiency figures. For you to take credit for these changes, you must use the Emissions Calculations Method, and any emission controls must be made enforceable in order for you to take credit for these controls.

If you have multiple printing processes on site (e.g., a sheetfed non-heatset offset press and a heatset web offset press) you will not be able to use the Materials Use method in Chapter 6 and you must determine your emissions using the Emissions Calculations method. Instructions for determining your PrintSTEP Level for air using the Emissions Calculations method follow.

1. GATHER BACKGROUND INFORMATION

- Review the *Process Tables* on the following pages and find the one(s) that describes your printing process(es). Look at the list of "VOC-containing Materials" in the first column of the appropriate Process Table(s). For each of these materials gather the following:

- 1. Page records (e.g., purchase, inventory records) of this material from the past 12 months;
- 2. Product data sheets, MSDSs, and information from suppliers for these materials, and
- 3. Destruction Removal Efficiencies and Capture Efficiencies of your pollution control equipment.

NOTE!! You must check your records to see if you use any type of materials in your printing process other than those listed in the *VOC-containing Materials* column. If these "other" materials constitute more than 10% of the VOCs or HAPs used in your facility, you must list these in the "Other materials" row.

2. COMPLETE THE APPLICABLE PROCESS TABLES

- If you have a ***controlled heatset web offset lithographic press***, you will have to fill in the shaded cells in the Process Table with the pollution control equipment's Destruction Removal Efficiency (DRE). Also, complete the calculations according to the column headers in the Process Table(s).
- If you have a ***controlled flexographic or rotogravure press with solvent-based ink***, you will need to fill in the shaded cells in the Process Table with the Destruction Removal Efficiency (DRE) and Capture Efficiency figures for your pollution control devices. Also, complete the calculations according to the column headers in the Process Table(s).
- For all other types of presses, the Process Table is already complete.

Process Table:

CONTROLLED HEATSET WEB OFFSET LITHOGRAPHY

	Column A		Column B
VOC-CONTAINING MATERIALS	**VOC EMISSIONS FACTOR[1] (before controls)**	**DESTRUCTION REMOVAL EFFICIENCY (DRE) of control device Fill in shaded cells**	**MULTIPLIER for emissions after controls Fill in shaded cells using: 1 - DRE**
Ink[2] (lbs)	0.80 (due to 20% retention factor)		
Hand Cleaning Solvent (gal)	0.50 [3] (due to 50% retention factor)	0	1
Automatic Blanket Wash (thru a control device) (gal)	0.40[4]		
Automatic Blanket Wash (NOT thru a control device) (gal)	0.60	0	1
Fountain Solution Concentrate/Additive (gal) (thru a control device)	0.70[5]		
Fountain Solution Concentrate/Additive (gal) (NOT thru a control device)	0.30	0	1
Adhesives and coatings (gal) (thru a control device)			
Adhesives and coatings (gal) (NOT thru a control device)		0	1
Other VOC-containing Materials			

[1] VOC Emissions factors (retention, and dryer carryover) are from the 1993 EPA draft CTG for Offset Lithography and the 1994 ACT for Offset Lithography.

[2] Ink includes lithographic varnishes and additives.

[3] 50% retention in shop towels can be used only if soiled towels are kept in a closed container and the vapor pressure of the cleaning solvent is less than 10mmHg at 200C. All others use 1.0.

[4] Applies only if the wash has a vapor pressure less than 10mmHg at 20□C.

[5] For alcohol substitutes only, use 0.70 reflecting 70% dryer carryover.

Process Table:
UNCONTROLLED HEATSET WEB OFFSET LITHOGRAPHY

	Column A	Column B
VOC-CONTAINING MATERIALS	**VOC EMISSIONS FACTOR[1] (before controls)**	**MULTIPLIER for uncontrolled processes**
Ink[1]	0.80	1
Hand Cleaning Solvent (gal)	0.50[2]	1
Automatic Blanket Wash (gal)	1	1
Fountain Solution Concentrate/Additive (gal)	1	1
Adhesives and Coating	1	1
Other VOC-containing Materials	1	1

Process Table:
NON-HEATSET WEB or SHEETFED OFFSET LITHOGRAPHY

	Column A	Column B
VOC-CONTAINING MATERIALS	**VOC EMISSIONS FACTOR[1] (before controls)**	**MULTIPLIER for uncontrolled processes**
Ink (lbs)[1, 6]	0.05	1
Hand Cleaning Solvent (gal)	0.50[2]	1
Automatic Blanket Wash (gal)	1	1
Fountain Solution Concentrate/Additive (gal)	1	1
Adhesives and Coatings	1	1
Other VOC-containing Materials	1	1

[6] Does not apply to UV-cured material

Process Table:

SCREEN PRINTING or FLEXOGRAPHY or ROTOGRAVURE: WATER-BASED INKS UNCONTROLLED FLEXOGRAPHY or ROTOGRAVURE: SOLVENT-BASED INKS

	Column A	Column B
VOC-CONTAINING MATERIALS	**VOC EMISSIONS FACTOR (before controls)**	**MULTIPLIER for uncontrolled processes**
Ink (gal)	1	1
Ink Dilution Solvent (lbs)	1	1
Coating (gal)	1	1
Adhesive (gal)	1	1
Cleaning Solvent (gal)	1	1
Other VOC-containing Materials	1	1

Process Table:

CONTROLLED FLEXOGRAPHY or ROTOGRAVURE: SOLVENT-BASED INKS

	Column A			Column B
VOC-CONTAINING MATERIALS	**VOC EMISSIONS FACTOR (before controls)**	**CAPTURE EFFICIENCY (CE) of control device** **Fill in column.**	**DESTRUCTION REMOVAL EFFICIENCY (DRE) of control device** **Fill in column.**	**MULTIPLIER for emissions after controls** **Calculate shaded cells using following equation: 1 - (CE x DRE)**
Ink (gal)	1			
Ink Dilution Solvent (gal)	1			
Coating (gal)	1			
Adhesive (gal)	1			
Cleaning Solvent (gal)	1			
Other VOC-containing Materials	1			

3. FILL IN THE EMISSIONS WORKSHEET

- You must fill out the Emissions Worksheet going from left to right, and completing each row before going on to the next. **THIS IS VERY IMPORTANT**.
- sample material is listed to clarify the directions below.

COLUMN 1

- Your Process Table lists the product categories whose VOC and HAP content will determine your PrintSTEP Air Level -- for example, inks, fountain solutions, cleaning solvent, and adhesives and coatings for lithography.
- Start with the first product listed in the Process Table(s) you filled out for your facility on pages E-2, E-3, and E-4.
- Write the name of product in Column 1.
- Fill in the row for ONE PRODUCT AT A TIME, completing the an entire row BEFORE going to the next.
- If you use more than one printing process, complete the table for one process at a time, using the appropriate Process Tables as necessary.

COLUMN 2

- Fill in Column 2 with the material's brand name, as given on your product data sheets or MSDSs.

COLUMN 3

- If the amount of material used is in gallons, convert to pounds by multiplying by the density (lbs/gal) of the product.
- Using your purchasing and inventory records, write down the pounds of product used during the past 12 months.

COLUMN 4

- "Column A" in your Process Table gives the emission factors for each material you listed.
- Copy the appropriate data in "Column A" from your Process Table, into Column 4 of the Emissions Worksheet.

COLUMN 5

- "Column B" in your Process Table gives the pollution control device multiplier for each product you listed in Column 1. This number will be a 1 for uncontrolled processes.
- Copy the appropriate data in "Column B" from your Process Table, into Column 4 of the Emissions Worksheet.

COLUMN 6

- Calculate your subtotal using the following equation:
- Column 6 = (Column 3) x (Column 4) x (Column 5)

COLUMN 7

- Find the VOC content of each material on the MSDS or product data sheets. Verify with your supplier. Values used must be consistent with values that would be obtained with EPA Method 24 for VOCs.
- Write this down in Column 7. VOC content must be entered into Column 7 as a fraction. This is the percentage by weight divided by 100 to get the weight fraction.
- You do not need to list different VOCs within a material on separate lines. You just need to list the total VOC content of every material.

COLUMN 8

- Calculate your VOC emissions by using the following equation:
- Column 8 = (Column 6) x (Column 7)
- Make sure your VOC emissions figure is in pounds.

WRAPPING UP

- When you finish filling out the table with all of your materials' individual VOC emissions, calculate the totals in the boxes at the bottom of Columns 8.
- Add up all of the entries in each column to find the grand total.

Emissions Worksheet:

(1) (2) (3) (4) (5) (6)

Material Category	Material Name	Amount Used (lbs)	Column A from process table	Column B from process table	Multiply Columns (3) x (4) x (5)
Ink	INKCO Red 442 heatset web offset lithography	10,000 lbs	0.80	0.10	800

Emissions Worksheet: (continued)

(7)	(8)
VOC Content (weight fraction)	**VOC emissions Col (6)x(10)**
0.50	400
-----	-----
Total VOC emissions:	

4. DETERMINE YOUR PrintSTEP AIR LEVEL BASED ON VOC EMISSIONS

- Look at the total pounds of VOC emissions that you calculated at the bottom of Column 8 of your Emissions Worksheet.
- GO to the Emissions Worksheet Air Level Table on page E-10.
- Find the column for your facility's location.
- **Within that column**, find the range into which your total VOC Emission (from the Emissions Worksheet Air Level Table) falls.
- Follow this row across to the right to the "PrintSTEP Level" column. Circle the PrintSTEP Air Level you find.
- Write that PrintSTEP Air Level:_____

5. DETERMINE YOUR FINAL PrintSTEP AIR LEVEL

- Compare the Levels circled in Part 4 above.
- The highest PrintSTEP Air Level is your final Level.
- Write your final PrintSTEP Air Level here: _____

Emissions Table:

for use with calculated VOC and HAP totals from the Emissions Worksheet

	VOCs	PrintSTEP VOC Level	HAPs	PrintSTEP HAP Level
Total Pounds of VOC or HAP emissions from materials used in the last 12 months	less than 10,000 pounds	**LEVEL 1** (<10% VOC major source threshold)	less than 10,000 lbs of any HAP **AND** less than 25,000 lbs of all HAPs	**LEVEL 1**
	10,000-20,000 pounds	**LEVEL 2** (. 10% and < 25% VOC major source threshold)	more than 10,000 lbs of any HAP **OR** more than 25,000 lbs of all HAPs	**LEVEL 2**
	20,000-50,000 pounds	**LEVEL 3** (. 25% and <50% VOC major source threshold)	more than 20,000 lbs of any HAP **OR** more than 50,000 lbs of all HAPs	**LEVEL 3**
	50,000-100,000 pounds	**LEVEL 4** (. 50% and <100% VOC major source threshold)		
	more than 100,000 pounds	**LEVEL 5** (. 100% VOC major source threshold)		